Comments on "Is Sperm Motility Maturation Affected by Static Magnetic Fields?"

In the paper titled "Is Sperm Motility Maturation Affected by Static Magnetic Fields?" (*1*), the authors conclude that "sperm production is unaffected because no changes were observed in testicular or epididymal weights after exposure to static magnetic fields."

This conclusion, however, is not supported by the data presented. With five animals per group and the standard deviations (SD) given (Table 2 of their paper), a calculation of the power of such comparisons is possible. With values of $\alpha = 0.05$ and $\beta = 0.80$, the minimal detectable difference (DD) is larger than the maximal observed difference (OD), for each parameter (see Table 1).

The results of the study are therefore unable to prove the nonexistence of an effect of static magnetic fields, at least with respect to the weight data.

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Reference

1. Tablado L, Pérez-Sánchez F, Soler C. Is sperm motility maturation affected by static magnetic fields? Environ Health Perspect 104:1212–1216 (1996).

Table 1.

Parameter	SD (avg)	DD	OD	Result
Body weight (g)	2.8	5.64	4.5	Inconclusive
Testis weight (mg)	18.0	36.2	21.0	Inconclusive
Epididymis weight (mg)	7.8	15.7	9.0	Inconclusive

Response

Alexander Lerchl has stated that our inference of a lack of effect of static magnetic fields on body, testis, and epididymis weights is not supported by statistical evidence. In his argument, he has calculated the power of the analytical method used for comparison between control and exposed animals and argues that the minimal difference detectable by the statistical procedure is larger than the differences found in our study. It should be clarified that his calculations are based on the assumption that a parametric test was used for comparison; the test that was actually performed was nonparametric (Kruskall-Wallis test) because the validating assumptions needed to perform a parametric test were not fulfilled. Concretely, none of the weight variables considered was normally distributed (as checked by the Kolmogorov-Smirnov test) and, moreover, for testis weight values, the variance was not homogeneous (Bartlett test, $p = 0.003$). In our opinion, calculating the power of a nonparametric test by using methods reserved for parametric statistical tests is inappropriate and, to the best of our knowledge, there is no reliable model for estimating the power of the former. We accept that, to avoid misinterpretation, we should have mentioned which of the variables used in our study were analyzed with each of the two tests mentioned in the statistical analysis section. In addition to the variables mentioned above, differences in percentage of sperm motility, percentage of progressive sperm motility, and wobble were also tested by the Kruskall-Wallis test. For the remaining variables a MANOVA was used.

Independently of the statistical question, we mention in the discussion section of our paper our reservations to the implications of the results concerning testis and epididymis weights based on the inconsistency of the findings reported in several works with respect to these endpoints. This led us to qualify the implications of our results concerning weight data in the abstract by expressing that "it appears that sperm production is unaffected because no changes were observed in testicular or epididymal weights after exposure to static magnetic fields," which constitutes the entire sentence quoted by Lerchl in his letter. This conclusion is enunciated in similar wording in the discussion section of the paper.

Notwithstanding this, we have also examined the testes from animals exposed prenatally and postnatally to static magnetic fields and we have failed to find alterations in their ultrastructure or in the proliferative activity of germ cells (unpublished results). This would seem to further support our findings.

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